
Acca Yard Bypass 15% Interim Design Report



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15% Interim Design Report

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Executive Summary

I. Statement of Purpose and Need

The Department of Rail and Public Transportation (DRPT) is in the process of developing an intercity passenger rail action plan as part of the Statewide Passenger Rail Plan. The action plan includes the need for data that will result from the evaluation and development of thirty-percent preliminary engineering, environmental review, signal design, and cost estimation for a route for intercity passenger trains from north and south of Richmond onto the CSX “S” Line and the Buckingham Branch Railroad to serve Main Street Station. As part of the alternative routing evaluation, DRPT has identified the need to review the existing planning documentation for the area around Main Street Station and along the track sections from Main Street Station to Doswell, VA by way of the Thoroughfare, Hermitage Lead Track, AY, Acca Yard, and onward to North Doswell.

II. Project Goals

The overall goal of the Acca Yard Bypass project is to initiate enhanced passenger service on the Richmond to Washington Corridor. The proposed Acca Bypass service is a functional, subset of the ultimate passenger service envisioned for the corridor that has been studied at various times in the past.

The infrastructure improvements identified in previous studies of the corridor focused on the infrastructure needs for the ultimate service. This project will develop and evaluate the first of several incremental steps needed to reach a recommended routing alignment that meets the desire of the Commonwealth to support improved freight and passenger rail operations.

The introduction of the enhanced passenger service will be configured to, at a minimum, preserve and protect the existing freight service and future capacity on the lines where the enhanced service operates.

III. Project Development

DRPT engaged the firm of Hatch Mott MacDonald LLC (HMM) under their Program and Project Management Consultant contract to evaluate identified locations or identify and evaluate new/additional locations of Richmond Area Improvements to improve the CSX “S” Line between Main Street Station and AM/Bone Dry Junction northward and to improve the Buckingham Branch Railroad line section between Hospital Street, Richmond, VA and Doswell interchange with the CSX RF&P Subdivision.

The project scope of work includes the evaluation of existing improvements identified in previous planning efforts, and to generate new/additional locations deemed necessary to provide for intercity passenger rail operations of all Amtrak Long Distance and regional trains to serve Main Street Station by way of the “S” Line and the Buckingham Branch Railroad. The signal, track, and roadway improvements will ultimately be developed to the thirty percent level of preliminary engineering. The environmental review and cost estimate will be developed to the thirty percent level.

An alternative analysis of the improvements necessary to operate the passenger trains between Main Street Station and Doswell by way of the Thoroughfare, Hermitage Lead Track, AY, Acca Yard. The improvements to be identified in the Alternatives Analysis will be coordinated with the Federal Railroad Administration to comply with their general requirements.

The detailed locations of the improvements will be verified based upon the results of a computer simulation built upon the modeling effort currently underway by the Department, and in response to a planned refinement of the model to detail the six year operations plan.

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The Department of Rail and Public Transportation (DRPT) is in the process of developing an intercity passenger rail action plan as part of the Statewide Passenger Rail Plan. The action plan includes the need for data that will result from the evaluation and development of thirty-percent preliminary engineering, environmental review, signal design, and cost estimation for a route for intercity passenger trains from north and south of Richmond onto the CSX “S” Line and the Buckingham Branch Railroad to serve Main Street Station. This project will develop and evaluate the first of several incremental steps needed to reach a recommended routing alignment that meets the desire of the Commonwealth to support improved freight and passenger rail operations. In addition to the route identified and evaluated in this report, a route over the Thoroughfare, Hermitage Lead Track, AY Junction, Acca Yard, and northward on the RF&P has been previously studied.

DRPT engaged the firm of Hatch Mott MacDonald LLC (HMM) under their Program and Project Management Consultant contract to evaluate identified locations or identify and evaluate new/additional locations of Richmond Area Improvements to improve the CSX “S” Line between Main Street Station and AM/Bone Dry Junction northward and to improve the Buckingham Branch Railroad line section between Hospital Street, Richmond, VA and Doswell interchange with the CSX RF&P Subdivision.

The project scope of work includes the evaluation of needed improvements identified in previous planning efforts, and to generate new, and or, additional locations needed to provide intercity passenger rail operations for all Amtrak Long Distance and regional trains to serve Main Street Station by way of the “S” Line and the Buckingham Branch Railroad. The signal, track, and roadway improvements will be developed to the thirty percent level of preliminary engineering. The environmental review and cost estimate will be developed to the thirty percent level.

To complete the activities started under the Tier 1 Environmental Impact Study, an alternative analysis of the improvements necessary to operate the passenger trains between Main Street Station to Doswell by way of the Thoroughfare, Hermitage Lead Track, AY, Acca Yard, and onward to North Doswell and the route presented in this report will be performed. The design and analysis of the improvements to be identified in the Alternatives Analysis will be coordinated with the Federal Railroad Administration to comply with their general requirements.

The detailed locations of the improvements will be verified based upon the results of a computer simulation built upon the modeling effort currently underway by the Department, and in response to a planned refinement of the model to detail the six year operations plan.

I. Passenger Service Plan

The proposed Acca Bypass service is a functional, subset of the ultimate passenger service envisioned for the corridor that has been studied at various times in the past.

The plan envisions providing service on the Richmond to Washington Corridor with trains departing Richmond at 30 minute intervals between 6 & 9 AM. Trains in the evening would arrive at Richmond at 30 minute intervals between 6 & 9 PM.

A combination of four existing Newport News trains, eight existing Richmond trains extended to Newport News, and two new Newport News regional trains will be evaluated to meet this schedule. The trains evaluated will operate from Newport News through Richmond and Washington and on to Boston and will operate as extensions of existing regional trains currently operated by Amtrak between Boston and Washington.

II. Buckingham Branch Improvements

Existing Conditions

The BBRR is comprised of former CSX (Chesapeake & Ohio) and is generally an east-west railroad from Richmond to Charlottesville to Clifton Forge. However, this segment of track runs generally north out of Richmond to Doswell.

The existing track is Class 2 and is composed of conventional track consisting of wooden crossties in stone ballast with either jointed or welded rail. The rail size varies between 112 RE and 132 RE. Rail condition is good to fair, however there are significant segments with a high percentage of engine burns on the south end of the line. Ballast conditions are fair to good with isolated sections of ballast fouling. Crossties are fair to poor but meet the requirements for Class 2 track.

The BBRR right-of-way along the segment generally extends 40 feet from the centerline of the existing track.

There is an MCI fiber optic trunkline running the entire length of the BBRR corridor from Richmond to Doswell. Construction of the proposed improvements will impact the MCI fiber optic trunkline in many locations.

Proposed Improvements

a. Ruffin Passing Siding MP 87.6 to MP 89.9

This 11,800 foot passing siding is envisioned as a location where the local freight train can clear the single main to allow through trains to pass while allowing the local to switch the industries located on the siding, as well as storing the long through freight trains that the BBRR receives from CSX.

There is an existing siding along the south side (geographic west) of the mainline at the Ruffin industrial area between MP 88.4 and MP 88.6. There are several active industrial spurs along this siding. Also, there are several abandoned industrial spurs with either switches, portions of switches, and adjacent track that must be removed.

Additionally, there is an industrial spur located on the north side (geographic east) of the mainline track at WE Ruffin. The turnout for this industrial spur is located in a curve and should be relocated. This turnout can only be relocated to a tangent after the existing crossover to the siding has been removed.

Right of Way

In the area of the Ruffin siding where there is a larger right-of-way than the typical 80' width found on the majority of the line.

Embankment

Between about MP 88.7 to about MP 89.5, the existing track is located on the edge of a steep cut with a steep embankment on the north side (geographic east). After MP 89.0, there are 3 locations where the existing embankment appears to be severely eroded from the outfall from existing cross drain culverts. One area appears to be further damaged from a previous derailment. The 15% design assumes embankment improvements with rip rap in these areas.



Drainage

At the west end (geographic north) of the existing Ruffin Siding, drainage along the industrial spur track connecting to the existing siding discharges

into a sandy area where the proposed freight siding is to be located. This groundwater should be drained away from the new siding. The 15% design assumes a new cross drain beneath the new siding and existing track.

b. Rich Foods Siding MP 91.9 to MP 93.2

This 5,000 foot passing siding is envisioned as a location where the local freight train can clear the single main to allow through trains to pass while allowing the local to switch the industries located on the siding.

The siding is an expansion of the existing siding between MP 92.3 and MP 92.7. Lengthening the siding eastward to MP 91.9 provides the 'tail' room for switching the industry at MP 92.4. The tail room provides space for the local train to pull cars out of the industry's track without going onto the single main.



The siding expansion westward to MP 93.2 takes an industrial track switch that is currently on the single main and shifts it to the siding. This allows the local to switch the industry without using the single main track.

Right of Way

The right of way in this area is the normal 80 foot width.

Embankment

The existing grades in the area of the siding are relatively level and will not require extensive embankment construction.



Drainage

There are no significant drainage issues along this siding. Conventional ditching should provide adequate flow paths for the railroad drainage.

Culverts under the existing siding and maintrack within the area of the new siding will be extended as required to maintain proper drainage.

c. Atlee Passing Siding MP 93.5 to MP 96.7

This 16,900 foot passing siding is split by a public grade crossing at MP 94.24, which reduces the maximum train storage length to 12,000 feet. It is envisioned as a location where the passenger trains can clear the single main to allow through trains to pass. The siding is long enough to store a through train to allow passing two long trains.

This siding is an expansion to the west of the existing siding between MP 93.5 and MP 94.4.

This siding is considered as a potential location for the proposed multi-modal transportation center.



Right of Way

The right of way in this area is the normal 80 foot width.

Embankment

The existing grades in the area of the siding vary from relatively level to high embankment. The high embankment at MP 95.4 will require extensive embankment construction. Due to the limited right of way, the additional embankment may require a retaining wall at the toe of slope to remain within the existing right of way.

Drainage

There are no significant drainage issues along this siding. Conventional ditching should provide adequate flow paths for the railroad drainage.

Culverts under the existing siding and maintrack within the area of the new siding will be extended as required to maintain proper drainage.

d. Bear Island Siding MP 108.1 to MP 108.5

This 2,000 foot passing siding is envisioned as a location where the local freight train can clear the single main to allow through trains to pass while allowing the local to switch the industry located on the siding.

The siding is a new siding that will provide 'tail' room for switching the industry at MP 92.4. The tail room provides space for the local train to pull cars out of the industry's track without going onto the single main.



Right of Way

The right of way in this area is the normal 80 foot width.

Embankment

The existing grades in the area of the siding vary from relatively level to a high shelf that the track runs across. The siding will run on the uphill side of the shelf along the southern side of the track.

Drainage

There are no significant drainage issues along this siding. Conventional ditching should provide adequate flow paths for the railroad drainage.

e. Kings Dominion Passing Siding MP 108.8 to MP 110.8

This 10,400 foot passing siding is envisioned as a location where the local freight train can clear the single main to allow through trains to pass, as well as storing the long through freight trains.

Right of Way

The right of way in this area is the normal 80 foot width.



Embankment

The existing grades in the area of the siding are relatively level with some high embankments at the east end.

Drainage

There are no significant drainage issues along this siding. Conventional ditching should provide adequate flow paths for the railroad drainage.

Culverts under the existing siding and maintrack within the area of the new siding will be extended as required to maintain proper drainage.

f. Doswell Connection

The Doswell Connection proposed to fit within the existing right of way at the crossing of the CSX RF&P Mainline with the Buckingham Branch. The connection has a maximum speed of 30 mph for passenger trains due to curvature, spiral length, and limited superelevation. The connection runs through the north eastern quadrant of the crossing, behind the closed Doswell Tower.

The connection crosses Doswell Road at grade at the northern end of the connection.

Right of Way

The right of way in this area comes from both the CSX RF&P Mainline and the Buckingham Branch.

Embankment

The existing grades in the area of the siding are relatively level and no significant embankment construction is anticipated.

Drainage

There are no significant drainage issues along this siding. Conventional ditching should provide adequate flow paths for the railroad drainage.



g. Single Main Improvements MP 85 to MP 112

The entire Buckingham Branch will be upgraded to provide higher speeds and reliable operations. The track will be upgraded to Class 5 standards.

Rail Improvements

The existing track will be upgraded by replacing the existing rail with 136# rail between to fill in the gaps of welded rail on the line. It is anticipated that approximately half of the existing wood ties will require replacement with new wood ties. The existing ballast is in generally good condition with some of the ballast showing signs of being fouled with decomposed ballast and debris. It is anticipated that some ballast cleaning will be needed.



Signal Improvements

The Buckingham Branch is currently operated under Dispatcher Control System (DCS) rules without any signals on the line except at the crossing diamonds over the CSX RF&P Mainline.

This project will install a wayside signal system on the entire segment to provide full Traffic Control System (TCS) on the line. Cab signals will not be installed, except at the Doswell Connection where trains will transition to the full Cab signaled Automatic Train Control (ATC) system used on the CSX RF&P Mainline.

The signal system will utilize data radio to connect the Control Points (CP's) with the advance and intermediate signals and the central control location.

Highway Grade Crossings

The public grade crossings on the Buckingham Branch have relatively new equipment, with most crossings having flashers and gates. This project will upgrade the crossing warning devices as needed to meet current standards. The project will also upgrade the circuitry to provide constant warning time at the crossings. The difference in speeds between the passenger trains and the freights would create situations where the proper warning time for the passenger trains would be excessive for the freight trains. Excessive warning times can lead to drivers driving around the gates.

Several of the grade crossings (Richmond-Henrico Turnpike and Route 54 for example) have high traffic volumes. These crossings will be reviewed for appropriate upgrades to maintain a high level of safety. Upgrades could range from additional light on cantilever, to channelization of the approach roadways, and four quadrant gates.



Bridge Improvements

The Buckingham Branch crosses several large rivers and many smaller waterways. A field assessment consisting of a cursory visual inspection of the accessible portions of the bridge structures to identify any major visible defects was conducted for all of the bridges on the segment. The objective of this assessment was to identify any severe structural defects for the existing railway structures that could significantly impact the cost of the proposed improvement.

Drainage

There are numerous smaller drainage structures on the segment. They were also visually inspected, although many of the pipes less than 18" in diameter recorded on the Valuation maps could not be located.

The embankment above the drainage structures were also reviewed for obvious signs of distress. The track profile was also used to indicate locations where the structures, the embankment, or both required repair.



III. “S” Line Improvements

Proposed Improvements

The “S” Line improvements include improvements north of the James River on the “S” Line and improvements on the Peninsula Sub between Rivana Jct and AM/Bone Dry Junction.

The design team has not been on CSX Right of Way prior to preparing this report and design. All the information presented below was obtained from public rights of way over, under, and adjacent to the CSX property.

a. Triple Crossing to Bone Dry

The section of the improvements takes place almost entirely on a steel viaduct that runs from the Triple Crossing northward through the Main St. Station to Bone Dry. The project will restore the track on the second set of viaduct spans through this segment. The original alignment will be used and will remain on the existing structures.

The bridge deck timbers and walkways on both tracks will be replaced in their entirety.

b. Triple Crossing to Bone Dry

The section of the improvements takes place almost entirely on a steel viaduct that runs from Rivana Junction northward through the Main St. Station to Am Junction. The project will restore the track on the second set of viaduct spans through this segment. The original alignment will be used and will remain on the existing structures.

At Rivana Jct., the original movable crossover will be restored with modern special trackwork. A diamond was considered, and after discussions with CSX, it appears that a movable point crossover or slip (puzzle) switch will be installed.

The bridge deck timbers and walkways on both tracks will be replaced in their entirety.

c. AM / Bone Dry Jct.

The most significant changes in this section will be at AM/Bonedry Junction. The project proposes to provide anew interlocking to connect the Buckingham Branch, Hermitage Lead, “S” Line, and the Peninsula

Sub. The new interlocking will be arranged to provide parallel routes through the interlocking to replace the existing single track bottleneck. The permanent speed restrictions on the viaduct and the curve limitations at Hospital Street will limit the maximum speed through the interlocking. The project proposes to us #15 turnouts in the interlocking due to their shorter length, and their maximum diverging speed in excess of the permanent restrictions.

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IV. RF&P Improvements

Proposed Improvements

The RF&P improvements include improvements between Doswell and Fredericksburg. The improvements are meant to be incremental steps toward the full third track in the corridor.

The design team has not been on CSX Right of Way prior to preparing this report and design. All the information presented below was obtained from public rights of way over, under, and adjacent to the CSX property.

a. Milford Passing Siding MP 35.1 to MP 38.7

The Milford Passing Siding is located on the east side of the RF&P Mainline. It utilizes portions of the existing industrial switching lead at Milford.

The new Control Points at the north and south end of the passing siding are proposed to have universal crossovers to allow trains on either of the existing tracks to access the new passing siding.



b. Guinea Passing Siding MP 44.4 to MP 47.4

The Guinea Passing Siding is located on the east side of the RF&P Mainline. It utilizes portions of the existing and abandoned siding at Guinea. The south end of the siding also uses abandoned segments of roadbed at Woodard.

The new Control Points at the north and south end of the passing siding are proposed to have universal crossovers to allow trains on either of the existing tracks to access the new passing siding.



V. Estimate

The estimate attached in Appendix 2 is based on the limited knowledge of the site conditions developed through our investigations at this time.

The estimate has a contingency of 40% added to the Total estimate to account for uncertainties and unknowns in the project. This amount is above the FTA's suggested amount of 18% to 25% at the planning stage due to the incomplete development of the project scope at this time.

Open scope items include;

- The location and configuration of the Newport News Station, turning, and layover facility.
- The ongoing modeling effort.
- The location for the Multi-modal Transit Center.
- NEPA impacts and mitigation requirements are not known at this time.

As the project progresses toward 30% and the open scope items are better defined, the contingency will be lowered to reflect the FTA guidance and the level of unknown items in the project.

Appendix 1 – Bridge & Structure Evaluations

I. Bridge Descriptions

a. Magnolia Street Bridge

The Magnolia Street Bridge carries the Buckingham Branch mainline and an abandoned spur over Magnolia Street. The bridge is a single, 32' span steel deck girder bridge with a timber deck and concrete abutments.

b. Timber Retaining Wall at M.P. 86.6

A timber retaining wall is present at the bottom of the rail embankment south of the Magnolia Street Bridge. The wall is approximately 250' long, and ranges from 12' high to 4' high toward the southern end. The timbers are horizontal lagging behind timber piles in some areas. Other sections are built of timber piles driven adjacent to one another.

c. Chickahominy Swamp Bridges

The Chickahominy Swamp Bridges carry the Buckingham Branch mainline over three channels in the Chickahominy Swamp. There are five total spans over the Chickahominy swamp. All of the bridges are identical 44' girder spans fabricated in 1900 by the Penncoyd Iron Works, and may have been at this location since that date. The spans are steel thru girder bridges with steel floorbeams and stringers and timber decks. The piers and abutments are masonry, a combination of brick and concrete. The M.P. 90.46 bridge is a two-span bridge, M.P. 90.56 is a single span, and M.P. 90.63 is another two span bridge.

d. Interstate 295 Bridge

The I-295 bridge carries the Buckingham Branch mainline and a parallel siding over Interstate highway I-295. The bridge was built in 1977, and is overall in good condition. The bridge is a two span (136'-136') simply supported steel thru girder bridge with a ballasted steel plate deck, concrete abutments and a concrete pier.

e. US Highway 301 Bridge

The US 301 bridge carries the Buckingham Branch mainline over US highway 301. The bridge was built in the early 1970s, and is overall in good condition. The bridge is a four span (39'-64'-64'-39') simply

supported steel deck girder bridge with a ballasted concrete deck, concrete multi-column piers and stub abutments.

f. South Anna River Bridge

The structure carrying the Buckingham Branch Railroad over the South Anna River consists of three (3) – 100', non-continuous, open deck spans, supported by two (2) - wall type stone block piers, a wall type stone block abutment (South) and a concrete abutment (North). The steel superstructure consists of two (2) - 9'-10" deep built-up, riveted deck plate girders. Intermediate transverse stiffeners are provided at a uniform spacing along the girders. Pin type bearings are provided at the piers and abutments. Cross-frames and lateral bracing at top and bottom flanges are provided. A handrail, walkway grating and steel conduit are attached to the East side of the bridge.

g. Little River Bridge

The structure carrying the Buckingham Branch Railroad over the Little River consists of two (2) – 55'-6", non-continuous, open deck spans, supported by a wall type concrete pier and wall type concrete wrap-around abutments. The steel superstructure consists of two (2) - 6'-0" deep built-up, riveted deck plate girders. Intermediate transverse stiffeners are provided at a uniform spacing along the girders. Steel bolster type bearings are provided at the pier and the abutments. Cross-frames and lateral bracing at top and bottom flanges are provided. A steel conduit is attached to the West side of the bridge. The Southern span of the bridge crosses over the Little River, and the Northern span crosses over a dirt access road.

II. Field Investigations

a. Magnolia Street Bridge

The tall concrete abutments are parallel. The north abutment is longer than the south abutment to accommodate the superstructure which is flared to carry the abandoned westward spur. The stems of the abutments are randomly cracked, some cracks with efflorescence. The concrete is predominantly sound despite the cracking. The bridge seats are covered with gravel and debris around the fascia girder bearings as well as between the girders.

There are four parallel girders under each track alignment. The anchor bolts at the fascia girders are severely rusted due to the accumulated debris on the bridge seats. The right bolt at the right fascia girder at the south abutment is the worst case observed, with 95% loss at the bearing

level. Some of the other anchor bolts appear to be in better condition, with minimal losses. The girder bearing plates are also rusted with section losses at the edges.

The deck girders appear to have minimal losses to the bottom flanges near the bearings, predominantly where debris is built up on the bridge seats. The paint is chipping and peeling throughout the span, with light rust on the exposed steel. There is minor web pitting along the bottom of the fascia girders, but there is little or no section loss reducing the capacity of the bridge despite the surface rust on the beams.

The bridge has a timber deck with spacing timbers between the railroad ties. The mainline rails are carried by aging ties and spacing timbers with metal grating safety walks on each side. A few walkway connectors are not connected to the ties, but the walkway is stable. Steel posts with a steel two-cable railing are present on the east side of the bridge and at the center of the bridge at the north end where the spur decking timbers split off from the mainline timbers.

The abandoned spur has no rails, but the timber deck remains in place over the bridge. The west railing, on the spur side of the bridge, is a timber railing in fair condition. Longitudinal deck planks form a safety walk along the railing, with leaf debris and vegetation covering 50% of the spur deck and the walkway planking. Vines are growing over the ends of the railing.

b. Timber Retaining Wall at M.P. 86.6

The timbers of the retaining wall are in various stages of deterioration, with uneven spacing leaving gaps in the wall face and areas at the base of wall, under the water surface, appearing completely deteriorated or missing. There are vertical piles with the entire core of the pile rotted out at the top and perhaps deeper into the section. The wall does not appear to have a predictable remaining life, though there are no signs of embankment failure due to the heavily vegetated slope with trees and undergrowth. The embankment does appear to have been reconstructed near the north end of the wall, at the highest section of wall.

c. Chickahominy Swamp Bridge M.P. 90.46

The substructure units are constructed of brick with concrete caps and facing. The concrete is in fair condition. 25% of the areas of the backwalls outside the superstructure are map cracked with some delamination and deterioration of the concrete. The concrete bridge seats also have areas of deteriorated concrete and map cracking, including areas at the bearings, though no undermining of the bearings was

observed. The abutment and pier bridge seats have moderate debris accumulations around the bearings adding to the moisture causing deterioration of the concrete. The exposed brickwork appears sound, with even joints but eroding pointing.

The anchor bolts have completely rusted and are not present at any substructure location. The steel bearing plates are rusted at the edges, but no significant section losses were observed to the plates.

The steel thru girders show pitted conditions throughout the spans where the protective coating is chipped or peeled, but with no significant section losses observed. The protective coating may be a lead-based paint system or a coal tar epoxy. The exterior bottom flange angles of all four girders had up to 100% section loss at the stiffeners adjacent to the abutment bearings. The losses appeared to have been caused by rusting of the material as well as abrasion of the bottom of the stiffeners against the bottom flange. The losses at these locations do not result in significantly reduced load capacity, but they may indicate that trains are inducing more vibration in the superstructure than the material is capable of withstanding over time. It was noted that uneven track work south of the bridge created a rocking motion in the cars crossing the bridge. These bottom flange losses were not noted on the other two swamp bridges.

There were two locations of minor impact damage to the girders. The end flange plate is bent on the right girder at the north abutment, and a knee brace flange above the left girder bearing of the south span at the pier. Neither damaged condition results in significantly decreased load capacity.

The girder bracing exhibits many locations of severe pitting leading to holes and section losses up to 100% of the angles. The gusset plate connecting the diagonal bracing to the left girder at the north abutment is completely rusted through at the edge of the bottom flange.

The floorbeams and stringers have little or no section loss. Gravel debris has accumulated on top of the floorbeam top flange angles between the deck ties.

The bridge has a timber deck with open spacing between the railroad ties. The thru girders act as the bridge railings.

d. Chickahominy Swamp Bridge M.P. 90.56

The substructure units are constructed of brick with concrete caps and facing. The concrete is in fair condition. 25% of the areas of the backwalls outside the superstructure are map cracked with some

delamination and deterioration of the concrete. The concrete bridge seats also have areas of map cracking, including areas at the bearings, though no undermining of the bearings was observed. The bridge seats have moderate gravel and debris accumulations around the bearings adding to the moisture causing deterioration of the concrete. The exposed brickwork appears sound, with even joints but eroding pointing.

The anchor bolts have severely rusted and are either no longer present or they were rusted to the point where they could be bent by hand. The steel bearing plates are rusted at the edges, but no significant section losses were observed to the plates.

The steel thru girders show pitted conditions throughout the span where the protective coating is chipped or peeled, but with no significant section losses observed. The protective coating may be a lead-based paint system or a coal tar epoxy.

The girder bracing exhibits many locations of severe pitting leading to holes and section losses up to 100% of the angles. This is the case near both abutments at the right girder and at mid-span on the left girder. Other bracing members also have significant losses. In the south span, the horizontal leg of the bracing angle at the left girder at the south abutment is rusted through for a 4" length.

The floorbeams and stringers have little or no section loss. Gravel debris has accumulated on top of the floorbeam top flange angles between the deck ties.

The bridge has a timber deck with open spacing between the railroad ties. The thru girders act as the bridge railings.

e. Chickahominy Swamp Bridge M.P. 90.63

The substructure units are constructed of brick with concrete caps and facing. The concrete is in fair condition. 25% of the areas of the backwalls outside the superstructure are map cracked with some delamination and deterioration of the concrete. The concrete bridge seats also have areas of deteriorated concrete and map cracking, including areas at the bearings, though no undermining of the bearings was observed. The abutment and pier bridge seats have moderate debris accumulations around the bearings adding to the moisture causing deterioration of the concrete. The exposed brickwork appears sound, with even joints but eroding pointing.

The anchor bolts have completely rusted and are not present at any substructure location, or they were rusted to the point where they could be bent by hand. The steel bearing plates are rusted at the edges, but no significant section losses were observed to the plates.

The steel thru girders show pitted conditions throughout the spans where the protective coating is chipped or peeled, but with no significant section losses observed. The protective coating may be a lead-based paint system or a coal tar epoxy.

The girder bracing exhibits many locations of severe pitting leading to holes and section losses up to 100% of the angles. The angle sections used for bracing have sections missing where they have rusted away at two locations between supports. This is the case in two locations in the north span: at the right girder at the north abutment and at the left girder at the pier. In the south span, the horizontal leg of the bracing angle at the left girder at the south abutment is rusted through for a 4" length.

The floorbeams and stringers have little or no section loss. Gravel debris has accumulated on top of the floorbeam top flange angles between the deck ties.

The bridge has a timber deck with open spacing between the railroad ties. The thru girders act as the bridge railings.

f. Interstate 295 Bridge

The tall concrete abutments are in good condition. No significant cracking was observed in the abutments. The bridge seats have a minor accumulation of gravel debris, but the debris does not cover the bearings or affect the movement of the bearings. The abutment bearings are fixed bearings.

The concrete pier is also in good condition. No significant cracking was observed in the pier. Rust staining was observed due to the weathering steel of the superstructure and bearings. The bearing seats have a minor accumulation of gravel debris, but it does not appear to be restricting the movement of the expansion bearings of either span.

The steel bearings are in good condition. There were no observed losses to the anchor bolts.

The steel through girders are in good condition. There were no significant section losses observed. Localized spots of section loss were beginning to occur on top of the deck plate connections to the girder webs where

debris is built up. These spots have no effect on the load carrying capacity of the bridge at this time.

There were a number of location where the knee brace to deck plate welds were cracked along one side of the knee brace. This condition was previously noted by a bridge inspector and the length of cracks annotated on the structure. No further cracking was noted since the previous inspection.

The floorbeams and stringers exhibited only the expected rust patina of the weathering steel material, with no visible section losses. The steel deck plate underside also exhibited just the rust patina with no visible losses. Where visible above the deck, only localized spots of the deck plate showed minor losses where debris was built up along the girders.

The ballasted deck provides a consistently sound support for the rail and ties throughout the structure. The thru girders serve as railings that meet current standards.

g. US Highway 301 Bridge

The concrete stub abutments are in good condition. No significant cracking was observed in the abutments. The bridge seats have little accumulation of gravel or debris, and the debris does not cover the bearings or affect the movement of the bearings. The abutment bearings are fixed bearings.

The concrete piers are also in good condition. No significant cracking was observed in the piers. The bearing seats have little or no debris, and it appears there is nothing restricting the movement of the bearings of any span.

The steel bearings are in good condition. The bearings and anchor bolts typically have surface rust at some edges of the plates and nuts, but there were no significant losses to the anchor bolts.

The steel girders are in good condition. There were no significant section losses observed. Localized areas of surface rust were present on the exterior girders below the deck joints, but no losses to the girders or bearing stiffeners were noted. Spots of light surface rust were forming where the paint has chipped at the edges of the beam flanges. These areas of rust have no effect on the load carrying capacity of the bridge at this time.

The steel diaphragms were in good condition.

The ballasted concrete deck provides a consistently sound support for the rail and ties throughout the structure. Stay in place forms were remain on the underside of the bridge, and were found in good condition. Metal pipe railings set on the concrete curbs provide safety railings on the bridge, and are in good condition. The flashings along each side of the bridge also appear to be in good condition. The deck joints at the second and third piers may be leaking, since the bearing stiffeners on the fascia girders exhibited surface rust below these joints.

h. South Anna River Bridge

The steel superstructure is in fair condition. The paint system has failed and surface rust was noted throughout the structure. Little or no section loss was noted on the steel members. The abutments, piers and bearings appear to be in fair condition.

i. Little River Bridge

The steel superstructure is in fair condition. The paint system has failed and surface rust was noted throughout the structure. Little or no section loss was noted on the steel members. The bearings are in fair condition.

Hammer sounding of the accessible portions of the piers and abutments revealed only minor and isolated areas of delamination or unsound concrete. Significant efflorescence was noted on the abutment walls.

The center pier is located immediately adjacent to the stream. The stream flow observed at a low stage appears to be very fast and turbulent through the bridge area. The top of the pier footing is visible through the water. Significant stream bank erosion was noted downstream of the bridge.

j. Culvert at MP 111.65

The culvert contains horizontal wood lagging for head and wingwalls that are in poor condition. Erosion was found behind the southbound headwall and a majority of the wing walls are rotting. The pipe is in good condition.

k. Culverts at MPs 111.4, 110.92, and 110.4

The other three culverts consist of concrete headwalls and wingwalls that are in good condition. The steel pipes at the culvert MP 110.4 have bent edges; however, it is in overall fair condition. The other culvert pipes are in good condition.

Appendix 2 – Estimate

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